

### **Abstract of the Disclosure**

A method for manufacturing a diffusion grating-based optical identification element is provided. The optical identification element includes a known optical substrate, having an optical diffraction grating disposed in the volume of the substrate. A large number of substrates or microbeads having unique identification codes can be manufactured winding a substrate, such as a fiber, around a polygonal shaped cage/basket to form a fiber ribbon having flat sections. A grating writing station writes one or more gratings into each flat section to form a unique code to this section. Each flat section of fibers of the fiber ribbon is written with the same gratings to provide the same identification code, or alternatively each flat section may be have a different grating(s) written therein so that each section has a different identification code. The fiber ribbon is then removed from the cage and diced to form a groups of optical identification elements, each group having unique optical identification codes.